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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Osamu Arisumi

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EXAMINER

INGHAM, JOHN C

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 09/617,138	Applicant(s) ARISUMI, OSAMU	
	Examiner JOHN C. INGHAM	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 February 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 1-4, 19 and 20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 5-9 and 11-18 is/are rejected.
- 7) ☒ Claim(s) 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 July 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's election without traverse of claims 5-18 in the reply filed on 15 February 2008 is acknowledged.

Claim Objections

2. Claims 5, 9 and 10 are objected to because of the following informalities:
Regarding claim 5, the first occurrence of "the ground film" lacks antecedent basis.
Regarding claims 9 and 10, "the interface" lacks antecedent basis. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claims **11-14** and **17-18** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. Regarding claim **11**, the claimed film has a "higher crystal orientation than that of the ground film". It is unclear how orientation characteristics of one film can be higher than that of another film. The claims have been interpreted so that the materials claimed in claim 13 and the materials recited as a ground film in the instant specification will meet the limitations claimed.

6. Regarding claim **17**, the claimed film “has a crystal orientation characteristic lower than that of the ground film”. It is unclear how or what orientation characteristics of one film can be lower than that of another film. The claims have been interpreted so that the materials claimed in claim 18 and the materials recited as a ground film in the instant specification will meet the limitations claimed.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims **5-7** are rejected under 35 U.S.C. 102(e) as being anticipated by Miyshita (US 6,543,107).

9. Regarding claim **5**, Miyashita discloses (Fig 1) a semiconductor device manufacturing method, comprising a process for forming a crystalline insulation film made of an ABO_3 perovskite type oxide dielectric (abstract) on a ground film (11), a process for forming an amorphous film (13), which is to be the crystalline insulation film, on the ground film and a process for forming the crystalline insulation film (14) by crystallizing the amorphous film at least from the upper surface side thereof (RTA oven bakes the amorphous film from at least top surface, see col 5 ln 65-col 6 ln 15).

10. Regarding claim **6**, Miyashita discloses the device of claim 5, wherein, of the ABO_3 perovskite type oxide dielectric, the A is a substance including Pb, while B is a substance including Zr (col 3 ln 16).

11. Regarding claim **7**, Miyashita discloses the device of claim 5, comprising a process for introducing the oxygen at least onto the upper surface of the amorphous film prior to the crystallization thereof (col 9 ln 59).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims **8-9** are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyashita and Takenaka (US 5,043,049).

14. Regarding claim **8**, Miyashita does not disclose the method of claim 5, further comprising a process for introducing a material, whose temperature at which the crystallization start is lower than that of the material constituting the amorphous film, at least onto the upper surface of the amorphous film prior to the crystallization of the amorphous film.

15. Takenaka teaches that Pb or Ti is implanted into the top surface of a perovskite type oxide dielectric prior to crystallization in order to maintain desired stoichiometric composition of the dielectric (col 2 ln 40). The implantation of Pb (A-site atom in the

ABO₃ formula) into the top surface will obviously increase the ratio of Pb at the top surface above the ratio of Pb at the interface of the dielectric and ground film as claimed in claim **9**.

16. Claims **15-18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyashita and Yokoyama (US 6,608,383).

17. Regarding claim **15**, Miyashita does not specify the method of claim 5, wherein the crystallization of the amorphous film from the side of the ground film is inhibited in the process for forming the crystalline insulation film.

18. Yokoyama teaches that a crystallization inhibiting film of a single layer of an oxidized Ir film is used on the lower side of a perovskite type oxide dielectric because it provides excellent barrier properties and crystal matching with the overlying dielectric (col 2 ln 54-60). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Yokoyama in the method of Miyashita in order to provide excellent barrier properties and crystal matching with the overlying dielectric.

19. Regarding claims **16 and 17-18** as best understood, Yokoyama teaches the method of claim 5 wherein a crystallization inhibiting film of oxidized Ir, whose temperature at which crystallization starts is higher (>600°C, col 3 ln 57) than that of the amorphous film (perovskite type oxide dielectric as disclosed by Miyashita, crystallized at 550°C, col 9 ln 55), is formed on a ground film (silicon substrate, col 7 ln 49-50). The film of oxidized Ir will inhibit the crystallization of the amorphous film from the side of the interface with the ground film and inherently has a crystal orientation characteristic lower than that of the ground film (silicon). Oxidized Ir film is used on the lower side of a

perovskite type oxide dielectric because it provides excellent barrier properties and crystal matching with the overlying dielectric (col 2 ln 54-60)

20. Claims **11 and 13** are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyashita, Yokoyama and Joo (US 5,817,532).

21. Regarding claim **11** as best understood, Miyashita and Yokoyama do not specify the method of claim 11, further comprising a process for forming a crystallization accelerating film, having a higher crystal orientation than that of the ground film, on the amorphous film prior to the crystallization of the amorphous film.

22. Joo teaches that a thin film of platinum (Pt) is formed on a perovskite type oxide dielectric before crystallization in order to properly control the nucleation sites of the dielectric (col 3 ln 10). Since the thin film is Pt (as claimed in **13**), it will inherently have a higher crystal orientation than that of the ground film (silicon substrate, Yokoyama col 7 ln 49-50).

Allowable Subject Matter

23. Claim **10** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

24. The following is a statement of reasons for the indication of allowable subject matter: the prior art does not disclose or make obvious the method of claim 10, wherein the composing ratio of the B-site atom of the amorphous film is set selectively so that

the temperature, at which the crystallization starts, is set to decrease gradually from the central portion of the amorphous film towards the upper surface and the interface *with the ground film*.

25. Claims **12 and 14** would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

26. The prior art does not disclose or make obvious the method of claim 12, further comprising a process for removing the crystallization accelerating film after crystallization of the amorphous film. Finally, the prior art does not disclose or make obvious the method of claim 14, wherein the constituting material of the crystallization film is an insulation material; an opening is formed in the crystallization accelerating film after crystallization of the amorphous film; further a process from forming an electrode to be connected with the crystalline insulation film through the opening is provided.

Conclusion

27. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Sone (US 6,323,057) and Maniar (US 5,391,393) disclose an annealing method of crystallizing an ABO_3 film. Basceri (US 6,194,229) discloses an ABO_3 film with the B site atom having a 70/30 ratio.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN C. INGHAM whose telephone number is (571)272-8793. The examiner can normally be reached on M-F, 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Howard Weiss/
Primary Examiner
Art Unit 2814

John C Ingham
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